 ORIGINAL

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
Amendment of the Commission's Rules to Provide for Unlicensed NII/SUPERNet Operations in the 5 GHz Frequency Range	)	ET Docket No. 96-102 RM-8648 RM-8653

COMMENTS OF NORTEL

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Dated: July 15, 1996

SUMMARY

As detailed in these comments, Northern Telecom Inc. ("Nortel") supports the proposed new unlicensed frequency band allocation because it believes that the resulting new services, enhanced efficiency and expanded manufacturing opportunities will well serve the public interest. The proposed allocation would extend the effective reach of the National Information Infrastructure by making possible high-bandwidth access and interaction throughout a limited area, both on an *ad hoc* peer-to-peer basis, and through wireless LANs. The resulting wireless "networks" connecting the growing number of multimedia devices will foster distance learning and telemedicine, and generally will enhance efficiency in commercial activities. Unfortunately, current allocations and wired solutions cannot adequately meet these critical needs.

The *Notice* raises several technical issues, including the suitability of the specific bands proposed to be allocated and the service rules that would apply to the proposed NII/SUPERNet service. As detailed in these comments, Nortel concurs with the Commission's selection of portions of the 5 GHz band for NII/SUPERNet. The segments of the 5 GHz band proposed to be allocated to the NII/SUPERNet service would appear to be available because of a reduced need for spectrum for the MLS. With the adoption of appropriate operating rules, the NII/SUPERNet devices should be able to share the 5 GHz band with the current and planned users in this band. The use of the 5 GHz

band has the additional benefit of aligning the NII/SUPERNet service with the European HIPERLAN, which will create additional export opportunities for U.S. businesses.

Nortel also supports the Commission's proposal to impose the minimum technical standards necessary to prevent interference to other services, and to ensure that the spectrum is used efficiently and fairly. Nortel agrees with the Commission's proposal to focus on the technical limits that will minimize any risk of interference to other services by the NII/SUPERNet service. In that vein, Nortel concurs with the Commission's proposal to adopt a minimal set of interim rules, and to allow the industry to develop the necessary permanent technical rules.

Nortel does have a few suggested improvements to the proposed interim rules, however. The proposed interim technical rules appear to have been adapted from the rules applied to unlicensed PCS. In light of the expected significant differences between the NII/SUPERNet service and unlicensed PCS, the interim rules should be modified to take account of those differences. Nortel's comments include specific revisions to the proposed technical rules.

Finally, Nortel supports Apple's proposal to apply a new Part 16 regulatory scheme to the NII/SUPERNet service. Under the Part 16 paradigm the service would be given primary status and thereby receive protection from incursions by other services. In light of the importance of reliability for the NII/SUPERNet

communications, Nortel believes that the NII/SUPERNet users should receive some protection from other services.

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Northern Telecom Inc. ("Nortel") hereby comments on the notice of proposed rulemaking addressing an allocation of spectrum for new, high-speed, wide-bandwidth wireless applications.[1/] As detailed below, Nortel supports the proposed new unlicensed frequency band allocation because it believes that the resulting new services, enhanced efficiency and expanded manufacturing opportunities will well serve the public interest. Thus, Nortel urges the Commission promptly to allocate spectrum and create service rules for the unlicensed frequency band allocation suggested in the *Notice*.

Nortel is the leading global supplier, in more than 100 countries, of digital telecommunications systems to businesses, universities, local, state and federal governments, the

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1/ Amendment of the Commission's Rules to Provide for Unlicensed NII/SUPERNet Operations in the 5 GHz Frequency Range, FCC 96-193, released May 6, 1996 (hereafter cited as "*Notice*").

telecommunications industry, and other institutions. The company employs more than 23,000 people in the United States in manufacturing plants, research and development centers, and in marketing, sales and service offices across the country.

Nortel has also been expanding its wireless operations, in light of the growing importance of spectrum as a communications medium. In February 1991, the company established a wireless systems organization that has as its objective the development of new wireless technologies and services to meet marketplace demands throughout the world. This group has been made comparable in organizational stature to the company's historical public and private network product line groups.

Nortel has been an active participant in the numerous fora addressing the development of new wireless services. Nortel was one of the early members and strong supporters of industry efforts to foster the development of new wireless services, including Telocator, the Wireless Information Networks Forum ("WINForum") and UTAM, Inc. In particular, Nortel worked with WINForum on its proposal for SUPERNet, and Nortel supported the petitions for rulemaking filed by WINForum and Apple Computer, Inc. ("Apple") that sparked this proceeding.[2/] Nortel is thus highly interested in this proceeding.

[2/] See Comments of Nortel, filed July 10, 1995.

I. Nortel Supports the Proposed Allocation of Spectrum for These Beneficial New Services

Nortel commends the Commission for initiating this proceeding to allocate spectrum for new wideband, high speed wireless services, referred to in the *Notice* as NII/SUPERNet.[3/] The proposed allocation would extend the effective reach of the NII by making possible high-bandwidth access and interaction throughout a limited area, both on an *ad hoc* peer-to-peer basis, and through wireless local area networks ("LANs").

Nortel agrees with the proponents and the Commission that continuing developments in digital devices, including multimedia computer applications, necessitates an allocation of spectrum to allow high-speed links among these computers.[4/] Nortel believes that there are a significant and growing number of applications for these computer-driven devices, and concomitantly there is a strong demand for the ability of these devices to communicate with each other. Such "networks" connecting these multimedia devices are essential for distance learning, telemedicine, and generally enhancing efficiency in commercial activities.

[3/] The *Notice* addresses the proposal of WINForum to establish a Shared Unlicensed PErsonal Radio Network ("SUPERNet") service, and the similar proposal of Apple to establish a National Information Infrastructure ("NII") Band. Although there were some differences between the two proposals, both parties advocated the creation of a wide-bandwidth, high-speed unlicensed service in the 5 GHz band.

[4/] E.g., *Notice* at ¶'s 31-35.

While in some cases communications paths could be created using wired networks or current allocations (i.e., unlicensed PCS spectrum in the 2 GHz band), those solutions are inadequate in a large (and growing) number of circumstances. The unlicensed PCS spectrum does not provide sufficient capacity to support high-speed, large bandwidth communications that are essential for multimedia and other similar applications.[5/] While wired networks can be designed with adequate capacity, they lack the flexibility and mobility that is essential in many cases. Thus, Nortel believes that there is strong demand that can only be fulfilled by the proposed new allocation.

Nortel agrees with the *Notice* that the public interest would be significantly advanced by the services made possible by the proposed NII/SUPERNet allocation.[6/] The allocation of spectrum for such a service will provide manifold public benefits: such a service will provide an important link in the national information infrastructure; such a service can link schools with the information superhighway, and allow more effective education; such a capability will greatly enhance telemedicine and allow more efficient consultation among medical

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[5/] Wider bandwidth channels under Parts 21, 94 and 101 that have already been allocated for point-to-point communications are not practical for many of the anticipated applications, because they are unsuited for most LAN/WAN uses. In addition, those channels are impractical for mobile or *ad hoc* applications, because of the delays in obtaining licenses (including pre-filing coordination and public notice) that would be necessary for each installation.

[6/] *Notice* at ¶ 33.

professionals; the enhanced ability to communicate will allow businesses to operate more efficiently as the United States seeks to remain competitive in the increasingly global marketplace; export opportunities will be created for U.S. businesses because of the alignment of these new services with the European HIPERLAN standards and frequency allocation. The result of these various opportunities and enhancements will be the creation of new jobs within the United States. For all of these reasons, Nortel supports the Commission's proposed allocation for the NII/SUPERNet unlicensed service.

II. Nortel's Responses to the Technical Issues Raised in the *Notice*

The *Notice* raises several technical issues, including the suitability of the specific bands proposed to be allocated and the service rules that would apply to the proposed NII/SUPERNet service. As detailed below, Nortel concurs with the Commission's selection of portions of the 5 GHz band for NII/SUPERNet. Nortel also supports the Commission's proposal to impose the minimum technical standards necessary to prevent interference to other services, and to ensure that the spectrum is used efficiently and fairly.

A. The Proposed NII/SUPERNet Service Can Coexist with Other Services Using the 5 GHz Band

Nortel believes that the need for the NII/SUPERNet service has been amply demonstrated. The ensuing issue is whether there is suitable spectrum to meet that need. Nortel agrees with the Commission's assessment that the 5 GHz band would be an appropriate location for the NII/SUPERNet service. The *Notice* proposes to allocate 200 MHz of spectrum in the lower portion of the band (5.15-5.35 GHz) and 150 MHz in the upper portion of the band (5.725-5.875 GHz) to the NII/SUPERNet service.

The lower portion of the 5 GHz band has become available because of a shift by the FAA away from using all of that portion of the band which had been set aside for a microwave landing system ("MLS"), and instead relying on GPS, the global positioning satellite system developed by the U.S. government. The spectrum thus freed up by moving away from MLS would be put to highly productive use for the proposed unlicensed, high-speed radio services.

Nortel believes that by confining the NII/SUPERNet service strictly to the 5.15-5.35 GHz band, the FAA (and the military) will still be able to use the 5.0-5.15 portion of the band for MLS. By imposing strict power and out-of-band emissions limits on the NII/SUPERNet service, the Commission will provide adequate protection to the aeronautical radionavigation activities in the lower portion of the 5 GHz band. Thus, to the

extent there is a continuing need for some MLS, that need can still be met in the 5 0-5.15 GHz portion of the band.

Nortel also concurs with the Commission's analysis of the potential for the NII/SUPERNet service to share the upper portion of the 5 GHz band (5.725-5.875 GHz) with existing amateur, unlicensed and industrial, scientific and medical ("ISM") activities.[7] The low power and access protocols proposed for the NII/SUPERNet service should facilitate sharing among all of these unlicensed services using the upper portion of the 5 GHz band.

Finally, to the extent the Commission is considering future possible allocations to Intelligent Transportation Systems ("ITS") in the 5 GHz band, Nortel believes that sharing with the NII/SUPERNet service would be possible if the Commission applies technical rules (including power levels, bandwidth and access protocols) to any such ITS applications that are similar to the rules applied to NII/SUPERNet. Thus, the proposed allocation to the NII/SUPERNet service does not foreclose the Commission from subsequently also allowing ITS to make use of this same spectrum.

If the Commission is considering potentially assigning other services, such as ITS, to share this band, Nortel urges the Commission to adopt as a policy in this proceeding the goal of ensuring compatibility with any new services authorized in this band in the future. Such a policy, combined with the proposals in the *Notice* for "deeming" compliant operations as non-

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[7] *Notice* at ¶ 35.

interfering and for a "Part 16" regulatory scheme, will provide a measure of protection to this unlicensed service.[8/] If the Commission in this manner provides manufacturers with some assurance that NII/SUPERNet users will not be displaced, the manufacturers will be encouraged to invest the resources necessary to undertake the research, development and manufacture of equipment for this service.

B. Nortel Supports the Commission's Proposal to Impose the Minimum Technical Standards Necessary

The Commission in the Notice proposes a number of technical rules for the NII/SUPERNet service, intending to leave manufacturers and users with as much flexibility as possible. The Commission would prescribe power limits, out-of-band emission limits and a basic LBT protocol standard. The Commission also proposes to encourage the industry to resolve any of the remaining outstanding technical issues. Nortel agrees with the Commission's proposal to focus on the technical limits that will minimize any risk of interference to other services by the NII/SUPERNet service

Nortel does have some comments on the specific technical proposals set forth in the *Notice*. The Commission questions whether antenna gain should be limited and, if so, to

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[8/] A commitment to ensuring future compatibility with any new services assigned to this band would be even more important if the Commission does not adopt these other two "protective" measures.

what level.[9/] To the extent the Commission permits the use of NII/SUPERNet for at least some outdoor use (e.g., creating campus-wide LANs), Nortel believes it would be appropriate to allow antenna gain. Antenna gain allows the user to extend the length of the communications path (potentially extending the range of interference/occupancy of the user), while at the same time limiting the potential interference zone to a relatively narrow lane. The use of directional antennas, which may include gain, is also a powerful technique to facilitate operation in the multipath propagation environment indoors. Nortel believes that the benefits of allowing antenna gain outweigh the potential costs, so that Nortel urges the Commission to allow power levels and antenna gain for the NII/SUPERNet in the upper portion of the 5 GHz band (5.725-5.875 GHz) similar to the Part 15.247 devices currently authorized for that band. With respect to the lower portion of the band (5.15-5.35 GHz), Nortel urges the Commission to apply power and antenna gain limits similar to those adopted in Europe for the HIPERLAN service.

The *Notice* also proposes relatively stringent out-of-band emissions limits for the NII/SUPERNet service, including a 50 dB attenuation on out-of-band emissions, application of the Section 15.209 limits on emissions in the "restricted" bands and general field strength limits below 1000 MHz, and application of the Section 15.207 conducted limits for devices that use an AC

[9/] *Notice* at ¶ 48.

power line.[10/] Nortel supports limits, and believes that the Commission should work with industry partners to clarify the limits and test procedures.

In a related vein, the *Notice* also suggests that if a NII/SUPERNet device is compliant with the rules adopted for the service, and located indoors at any height, or outdoors no more than 15 meters above the ground, then it would not be deemed to cause interference.[11/] Nortel believes that adoption of such a rule would be appropriate, and would simplify demonstrating compliance with Part 15 (or potentially Part 16) requirements that devices not interfere with licensed services. Nortel thus supports this proposal.

The *Notice* proposes not to adopt the suggestion of WINForum to impose a channeling plan for the NII/SUPERNet service.[12/] Nortel believes that while the Commission need not adopt a detailed channelization scheme, it should establish a minimum channel bandwidth of 25 MHz. Such a limited channel plan would serve to make the NII/SUPERNet service compatible with HIPERLAN, and in addition would simplify the access protocol by limiting the number of places where the device would need to scan when listening.

Nortel also supports the Commission's proposal to adopt an interim basic sharing protocol in this proceeding, and allow

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[10/] *Notice* at ¶ 49.

[11/] *Notice* at ¶ 54.

[12/] *Notice* at ¶ 51.

the industry to develop appropriate etiquette protocols through a cooperative consensus.[13] Nortel believes that such a process, driven by the industry, is likely to lead to sharing techniques that will best serve the public interest. The use of such standards will maximize spectrum utilization efficiency, and additionally maximize coexistence and compatibility among disparate systems.[14]

Through such a cooperative industry process, the needs of the consumers and the capabilities of the manufacturers can be integrated into the necessary standards. Moreover, as demonstrated by the cooperative efforts exhibited during the industry development of a consensus on the unlicensed PCS spectrum etiquette, the process can work effectively. Thus, Nortel supports the Commission's proposal to adopt only an interim spectrum etiquette in this proceeding and to leave it to the industry to develop the appropriate "permanent" rules.[15] This work will require due care and attention to accommodate the wide range of possible applications and technologies that will

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[13] *Notice* at ¶ 52.

[14] In particular, Nortel believes that it is important to ensure compatibility between the NII/SUPERNet service and the European HIPERLAN service so as to facilitate the ability of manufacturers to serve both markets. In this manner, export opportunities for American manufacturers will be greatly enhanced.

[15] Nortel assumes that the Commission will not codify the industry-developed standards into its Rules, but instead will simply cross-reference the industry standards. In this manner, the standards will be able to evolve over time, if necessary, without the need for the Commission to conduct a formal notice and comment rulemaking.

use the new band. Nortel intends to participate actively in those industry efforts.

Nortel believes, however, that some adjustments are necessary to the specific interim LBT protocol proposed. The *Notice*'s proposal appears to have been adapted from the rules applied to unlicensed PCS. Those rules were developed for the independent asynchronous devices operating with relatively low data rates (on the order of one or two megabits per second with burst lengths of the order of a few milliseconds) to be provided over unlicensed PCS spectrum in the 2 GHz band. The NII/SUPERNet services, in contrast, are expected to employ devices making use of over-the-air bit rates in excess of 25 megabits per second, and typical burst lengths for these devices may be only a few microseconds. Consequently, the proposed deference intervals of 50 to 750 microseconds will result in very inefficient use of the channels for devices with shorter burst lengths.

Nortel thus makes the following suggestions to adapt the interim rules more closely to the needs of the NII/SUPERNet devices:

(a) Nortel suggests that because the proposed bit rates in the 5 GHz band are approximately ten times the bit rates in the lower bands, the deference and response timings should be reduced accordingly;

(b) In order to ensure that the band is used efficiently by high bit rate devices, Nortel suggests that the minimum allowed emission bandwidth in the 5.15-5.35 GHz band be no less than 25 MHz;

(c) In the 5.725-5.875 GHz band, Nortel proposes that devices be permitted an EIRP of up to one watt,

subject to the limitations of § 15.407(d) and the necessity to ensure non-interference to licensed devices, in order that NII/SUPERNet devices are compatible with other authorized services in this band;

(d) Proposed § 15.407(a) limits the power spectral density of devices to 0.03 milliwatts in 3 kHz. For devices with a bandwidth of 25 MHz, this would require the emission to be flat across the channel to within 3 dB. Nortel's experience has been that this is not practical to achieve for all conditions of modulation. Nortel thus suggests that the proposed spectral density limit be increased to 0.06 milliwatts per 3 kHz to provide an additional 3 dB of margin.

Attached to these comments are the specific edits of Nortel with regard to the interim LBT protocol rules proposed for the NII/SUPERNet service. Nortel recognizes that the details of the interim rules will be the subject of considerable industry commentary, and that further alternative contributions may be needed to make the interim service rules more amenable to the NII/SUPERNet service.

III. Nortel Supports the Adoption of a Part 16 Regulatory Scheme

The *Notice* proposes to apply the Commission's Part 15 regulatory scheme to the NII/SUPERNet service. Nortel urges the Commission instead to adopt the Apple proposal to apply an unlicensed "Part 16" regulatory regime to this new service.[16/] Under the Part 16 paradigm, the service would be given primary status and thereby receive protection from incursions by other

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16/ *Notice* at ¶ 57.

services. The "Part 16" approach would thus differ from a Part 15 regulatory scheme in which those unlicensed services are secondary to other services. Under the Commission's proposal, coexistence in this band among the NII/SUPERNet users would be assured by the spectrum usage rules for this service, and protection to other services would be assured by strict out-of-band emission limits, the LBT spectrum etiquette, and power limits.

In contrast, without the use of a Part 16 regulatory scheme, the NII/SUPERNet users would be subject to interference by other licensed services either in-band or out-of-band. In light of the importance of reliability for the NII/SUPERNet communications, Nortel believes that the NII/SUPERNet users should receive some protection from other services. Nortel thus supports adoption of a new Part 16 and application of that regulatory model to the NII/SUPERNet service.

The *Notice* also raises the question of whether the Commission has the authority to adopt such a Part 16 regulatory scheme, or whether additional Congressional authority is necessary.[17/] Nortel believes that the Commission already has the ability to adopt a Part 16 regulatory model for the NII/SUPERNet service. Section 301 of the Communications Act, which specifies the Commission's jurisdiction over radio transmissions, indicates that the Commission will require a license to transmit, *inter alia*, "within any State when the

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[17/] *Notice* at ¶ 60.

effects of such use extend beyond the borders of said State, or when interference is caused by such use or operation with the transmission of such energy, communications, or signals from within said State to any place beyond its borders.... " [18] In light of the low power and LBT protocol, the NII/SUPERNet service will be operating on a non-interfering basis, and thus would appear to fall outside the license requirement. Moreover, Nortel also observes that Congress granted the Commission with broad authority, including "necessary and proper" authority,[19] and the ability to define "citizens band radio service" not subject to individual licenses.[20] Taken together, Nortel believes that Congress has already granted the Commission with authority to establish a Part 16 regulatory scheme for unlicensed services.

IV. Conclusion

Nortel concurs with the Commission's determination that there is a need for the NII/SUPERNet service that cannot be fulfilled at present. Nortel also believes that the 5 GHz spectrum proposed to be allocated is well-suited for the NII/SUPERNet service, since these new users will be able to coexist with the current and planned occupants of that band. Nortel also supports the Commission's proposal to adopt technical rules for the NII/SUPERNet service that provide manufacturers and

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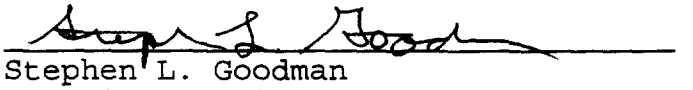
[18] 47 U.S.C. § 301(d).

[19] 47 U.S.C. § 303(r) and 47 U.S.C. § 154(i).

[20] 47 U.S.C. § 307(e)(3).

users with as much flexibility as possible, and to leave it up to the industry to adopt the necessary spectrum etiquette protocols. Finally, Nortel urges the Commission to adopt a Part 16 regulatory model for the NII/SUPERNet service. Nortel believes that by taking all of these steps to create the NII/SUPERNet service, the Commission will well serve the public interest.

Respectfully Submitted,



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Dated: July 15, 1996

Proposed Revisions to the Rules for the NII/SUPERNet Service

§ 15.407 General technical requirements.

(a) Under all conditions of modulation, the maximum peak ~~EIRP~~ output power from an intentional radiator operating under the Section in the 5.15 - 5.35 GHz band shall not exceed -10 dBW. Under all conditions of modulation, the maximum peak output power from an intentional radiator operating under this section in the 5.725 - 5.875 GHz band shall not exceed 0 dBW. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. Additionally, power spectral density shall not exceed ~~0.03~~ 0.06 milliwatts in any 3 kHz bandwidth, as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

(b) Emissions radiated outside of the frequency band of operation shall be attenuated by at least 50 dB below the level of the fundamental emission or to the general radiated emission limits in Section 15.20 of his part, whichever is the lesser attenuation. Equipment manufacturers should note that the provisions of Section 15.205 apply to intentional radiators operating under this section.

(c) The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude transmission of control or signalling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

(d) The device must comply with IEEE C96.1-191 (ANSI/IEEE C5.1-1992), "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz." Measurement methods are specified in ... (from Section 15.319(i)).

(e) The frequency stability of the carrier frequency of an intentional radiator operating under this section shall be ± 10 ppm over 10 milliseconds or the interval between access monitoring, whichever is shorter. The frequency stability shall be maintained over a temperature variation for outdoor installations of -20 degrees to +50 degrees Celsius and for indoor installations of 0 degrees to +50 degrees Celsius at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20 degrees Celsius. For equipment that is capable of operating only from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.

§ 15.411 Spectrum etiquette

(a) The intentional radiator must incorporate a mechanism for monitoring the spectrum that its transmission is intended to occupy. The following criteria must be met:

(1) Immediately prior to initiating a transmission, devices must monitor the spectrum window they intend to use for at least ~~50~~ 5 microseconds.

(2) The monitoring threshold must not be more than 32 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth of the device.

(3) If no signal above the threshold level is detected, a transmission burst my commence in the monitored spectrum window. Once a transmission burst has started, an individual device or a group of cooperating devices is not required to monitor the spectrum window provided the intraburst gap timing requirement specified below is not exceeded.

(4) After completion of a transmission, an individual device or cooperating group of devices must cease transmission and wait a deference time randomly chosen from a uniform random distribution ranging from ~~50 to 750~~ 5 to 25 microseconds, after which time an attempt to access the band again may be initiated. For each occasion that an access attempt fails after the initial inter-burst interval, the range of the deference time chosen shall double until an upper limit of ~~12 milliseconds~~ 100 microseconds is reached. The deference time remains at the upper limit ~~of 12 microseconds~~ until an access attempt is successful. The deference time is re-initialized after each successful access attempt.

(5) The monitoring system bandwidth must be equal to or grater than the emission bandwidth of the intended transmission and shall have a maximum reaction time less than ~~50~~ 5xSQRT 12.5/emission bandwidth in MHz) microseconds for signals at the applicable threshold level but shall not be required to be less than ~~50~~ 0.5 microseconds. If a signal is detected that is 6 dB or more above the threshold level, the maximum reaction time shall be ~~35~~ 3.5xSQRT (12.5/emission bandwidth in MHz) microseconds but shall not be required to be less than ~~35~~ 0.35 microseconds.

(6) The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent receptior at that location.

(7) Devices that have a power output lower than the maximum permitted under the rules may increase their

detection threshold by one decibel for each one decibel that the transmitter power is below the maximum permitted.

(b) The transmission burst duration from one device or group of devices acting cooperatively shall be no greater than 10 milliseconds. Any intraburst gap between cooperating devices shall not exceed ~~25~~ 2.5 microseconds.

(c) All systems of less than ~~25~~ 30 MHz emission bandwidth shall start searching for an available spectrum window within 30 MHz of the band edge at 5150, 5350, 5725, or 5875 MHz while systems of more than ~~25~~ 30 MHz emission bandwidth will first occupy the center half of the band. ~~Devices with an emission bandwidth of less than 10 MHz may not occupy the center half of the band if other spectrum is available~~.

(d) Within the 5.15 - 5.35 GHz band the minimum emission bandwidth of any intentional radiator shall be no less than 25 MHz. If needed, devices may aggregate adjacent channels for transmission if the channels are available for use under 15.411(a).